

Claims

- [c1] 1. An arc welding quality evaluation apparatus characterized in that, in consumable electrode gas-shielded arc welding, wherein a welding voltage is applied between a welding wire and a workpiece to be welded, molten metal droplets from the welding wire are transferred to the workpiece, and that portion of the wire consumed by the transfer of droplets is replenished, for performing continuous arc welding, it comprises
- a heat input detection means for detecting heat input applied to the workpiece, from the welding voltage applied thereto and welding current supplied thereto;
 - a welding time detection means for detecting workpiece welding time;
 - a spatter weight detection means for detecting the weight of spatter produced during the workpiece welding time;
 - a heat compensation means for compensating for heat loss due to spattering during the workpiece welding time;
 - an effective heat input computation means for computing effective heat input based on detected values of the heat input detection means and welding time detection means, and a heat compensation value of the heat compensation means; and
 - a weld quality assessment means for assessing weld quality acceptability based on the degree of separation of an output of the effective heat input computation means from a reference standard value.
- [c2] 2. An arc welding quality evaluation apparatus characterized in that, in consumable electrode gas-shielded arc welding, wherein a welding voltage is applied between a welding wire and a workpiece to be welded, molten metal droplets from the welding wire are transferred to the workpiece, and that portion of the wire consumed by the transfer of droplets is replenished, for performing continuous arc welding, it comprises
- a supplied wire weight detection means for detecting the weight of welding wire supplied;
 - a spatter weight detection means for detecting the weight of spatter produced during the workpiece welding time;
 - a weld metal deposition efficiency computation means for computing efficiency

of deposition of welding wire metal on the workpiece, based on values detected by the supplied wire weight detection means and the spatter weight detection means; and

a weld quality assessment means for comparing an output value of the weld metal deposition efficiency computation means with a reference standard value, and assessing weld quality acceptability based on the degree of separation of the computation means output value from the reference standard value.

[c3]

3. An arc welding quality evaluation apparatus characterized in that, in consumable electrode gas-shielded arc welding, wherein a welding voltage is applied between a welding wire and a workpiece to be welded, molten metal droplets from the welding wire are transferred to the workpiece, and that portion of the wire consumed by the transfer of droplets is replenished, for performing continuous arc welding, it comprises

a supplied wire weight detection means for detecting the weight of welding wire supplied;

a spatter weight detection means for detecting the weight of spatter produced during the workpiece welding time;

a deposited metal weight computation means for computing the weight of welding wire metal deposited on the workpiece, based on values detected by the supplied wire weight detection means and spatter weight detection means; and

a welding quality assessment means for comparing an output value of the deposited metal weight computation means with a reference standard value, and assessing weld quality acceptability based on the degree of separation of the output value from the reference standard value.

[c4]

4. An arc welding quality evaluation apparatus characterized in that it comprises

a welding quality assessment means that computes a molten metal cross-sectional area of a workpiece, using a first conversion diagram for converting an output value of an effective heat input computation means according to Claim 1 to a workpiece molten cross-sectional area, compares the molten metal cross-sectional area to a reference standard value, and assesses weld quality acceptability based on the degree of separation of the molten metal cross-sectional area from the reference standard value.

- [c5] 5. An arc welding quality evaluation apparatus characterized in that it comprises a welding quality assessment means that computes a deposited metal cross-sectional area of a workpiece, using a second conversion diagram that converts an output value of a deposited metal weight computation means according to Claim 3 to a deposited metal cross-sectional area, compares the deposited metal cross-sectional area to a reference standard value, and assesses weld quality acceptability based on the degree of separation of the deposited metal cross-sectional area from the reference standard value.
- [c6] 6. An arc welding quality evaluation apparatus characterized in that it comprises a welding quality assessment means that computes an effective cross-sectional area by subtracting the deposited metal cross-sectional area according to Claim 5 from the molten metal cross-sectional area according to Claim 4, compares the effective cross-sectional area to a reference standard value, and assesses weld quality acceptability based on the degree of separation of the effective cross-sectional area from the reference standard value.
- [c7] 7. An arc welding quality evaluation apparatus according to any one of Claims 1 through 6, characterized in that it comprises a weld quality assessment means wherein heat input, deposited metal weight, molten metal cross-sectional area, deposited metal cross-sectional area, and effective cross-sectional area, as recited in Claims 1-6, are computed as average values over the welding time, each average value is compared to a reference standard value set to the respective average value during optimum welding conditions, and weld quality acceptability is assessed based on the degree of separation of the average value from the reference standard value.